

STUDIES IN THE TREATMENT OF MALARIA

XXI. ARSENIC IN SIMPLE TERTIAN MALARIA

BY

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Many statements concerning the value of arsenic in the treatment of malaria are found in the literature, but with the exception of a few more recent records relating to organic preparations we have been unable to discover the evidence on which such statements are based.

We proceeded therefore to determine (1) whether inorganic arsenic alone has any action—palliative or curative—in simple tertian malaria, and if so in what dose it should be administered; and (2) whether a combination of arsenic and quinine is more effective than quinine alone. The observations made by us can be divided into the following four groups:—

GROUP I. Small doses of arsenic.

- A. Liquor arsenicalis* minims 15 daily, for 8 weeks.
- B. The same as Treatment A, with an injection of Quinine 2 HCl grains 15 intramuscularly on each of the first two days only.

* The British Pharmacopoeia preparation containing 1 per cent. of arsenious anhydride.

GROUP II. Small doses of arsenic, or of arsenic and strychnine, with quinine.

- C. Liquor arsenici HCl* minims 15 + Quinine HCl grains 5, daily for 8 weeks.
- D. Liquor arsenici HCl minims 15 and Liquor strychninae HCl minims 15 + Quinine HCl grains 5, daily for 8 weeks
- E. Control Series. Quinine HCl grains 5 daily for 8 weeks.

GROUP III. Large doses of arsenic.

- F. Liquor arsenicalis minims 30 daily, with one or two periods of intermission, for 8 weeks.
- G. The same as Treatment F, with an injection of Quinine 2 HCl grains 15 intramuscularly on each of the first two days only.
- H. Control series. Quinine 2 HCl grains 15 intramuscularly on each of two consecutive days only.

All the cases were adult males, the great majority of whom were infected either in Macedonia or in East Africa (Tables XIV to XIX). In every instance a diagnosis of simple tertian malaria was made microscopically, and in all cases parasites were present in the blood on the day treatment commenced. Blood examinations were made daily.

The records of the observations are given in the tables and charts.

In the tables:—

- o = absence of fever and parasites.
- 1, 2, etc. = number of parasitic febrile relapses, weekly.
- 1*, 2*, etc. = number of non-parasitic febrile attacks, weekly.
- P¹, P², etc. = number of days on which parasites were present weekly.
- Remarks = post-treatment observations.

In the charts:—

- T. = simple tertian trophozoites or schizonts.
- G. = simple tertian gametes.
- Neg. = no parasites found.

NOTE.—A rise of temperature above 100° F., of which the nature is unknown, is termed a *febrile attack*. A similar rise of temperature accompanied by parasites in the blood at the time, or within three days, is termed a *parasitic febrile relapse* or *true relapse*. The term *paroxysm* is used indifferently to denote any febrile disturbance of 100° F. or more.

As we have pointed out elsewhere, the effect of any treatment may be considered from two points of view: (1) the *palliative* action, i.e., the degree to which symptoms are controlled, and the blood kept free

* The British Pharmacopoeia preparation containing 1 per cent. of arsenious anhydride.

from parasites during the treatment; and (2) the *curative* action, i.e., whether or no relapses occur during the observation period* after cessation of treatment. In order that the palliative results obtained in the various series of observations may have a comparative value, it is necessary to express the number of cases having true relapses, of those having febrile attacks, and of those having parasitic relapses, as percentages of the total cases undergoing treatment in any particular week. In Tables II, IV, VI, IX and XI, the following sets of figures, each having a comparative value, are given:—

1. The number of cases which had parasitic febrile relapses each week, expressed as a percentage of all cases treated.
2. The number of parasitic febrile relapses experienced per week by each parasitic febrile relapse case.
3. The number of cases which had febrile paroxysms (parasitic and non-parasitic) each week, expressed as a percentage of all cases treated.
4. The number of febrile paroxysms (parasitic and non-parasitic) experienced per week by each febrile (parasitic and non-parasitic) case.
5. The number of cases which had parasitic relapses (febrile and non-febrile) each week, expressed as a percentage of all cases treated.
6. The number of parasitic relapses (febrile and non-febrile) experienced per week by each parasitic relapse (febrile and non-febrile) case.

GROUP I. Small doses of arsenic

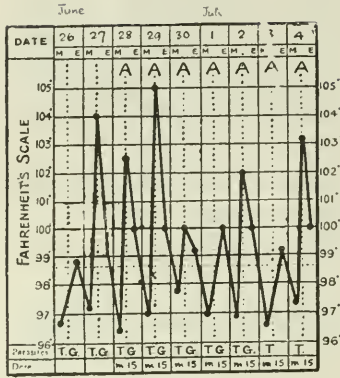
A. *Liquor arsenicalis* minimis 15 daily.† (Cases 1186 to 1188).

Three cases only were treated in this manner, as it was soon found that *Liquor arsenicalis* in this dose failed to cause the disappearance of parasites from the cutaneous blood or to control the fever. In two cases (1186 and 1187) it was found necessary to alter the treatment after seven days, in the third case (1188) after twenty-two days. Details are given in Charts 1186 to 1188.

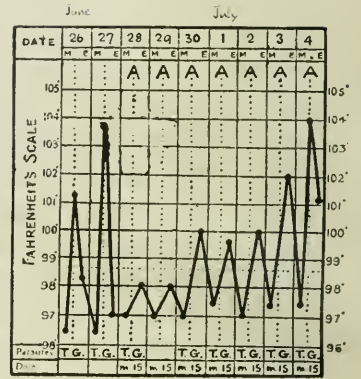
* This, as in all our previous papers, is 60 days—an entirely arbitrary period.

† *Liq. arsenicalis* ℥ v
Aq. chloroformi ad ℥ i
 ̄ i. t.d.s.

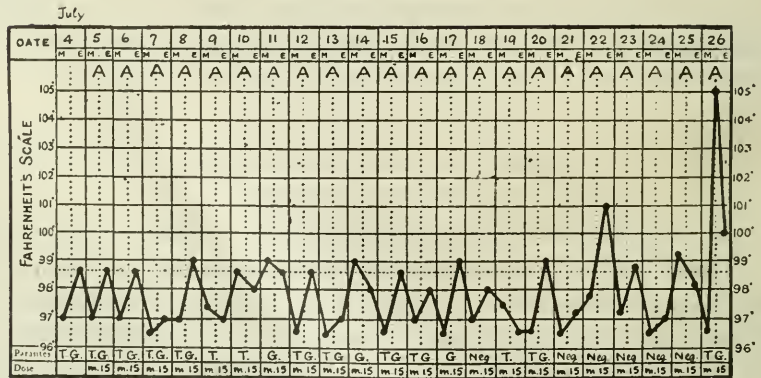
CASE 1186



CASE 1187

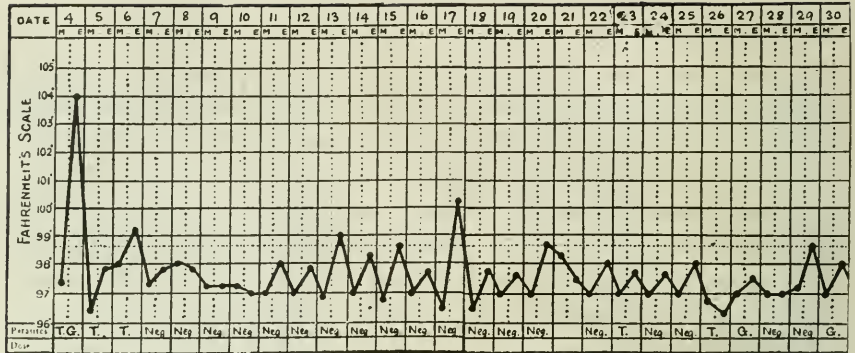


CASE 1188



CASE 1190 (Part I)

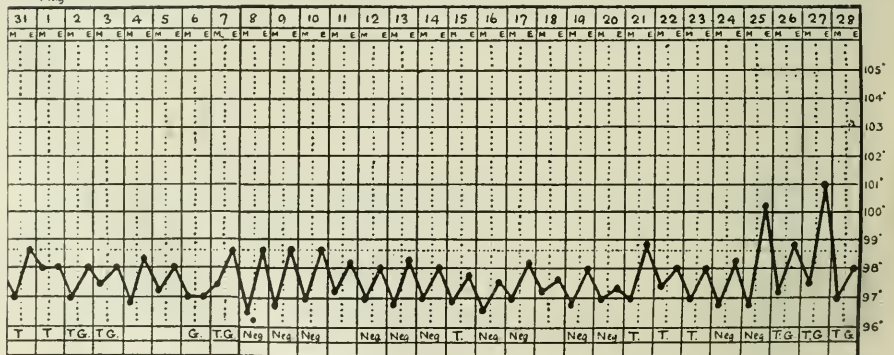
July



Treatment commenced 5 July.

CASE 1190 (Part II)

Aug



CONCLUSION

Liquor arsenicalis alone, minims 15 daily, fails to cause the disappearance of parasites or to control the symptoms, and does not suffice to prevent relapses (parasitic and febrile) in cases in which parasites and fever have disappeared as the result of two initial intramuscular injections of quinine bihydrochloride.

**GROUP II. Small doses of arsenic, or of arsenic and strychnine,
with quinine**

We next proceeded to ascertain whether combinations of (1) arsenic + quinine, or (2) arsenic and strychnine (on account of the alleged tonic effect of the latter) + quinine, were more effective than quinine alone. For this purpose the following three series (C, D, and E) of observations were undertaken.

C. Liquor arsenici HCl minims 15 + Quinine HCl grains 5 daily* for eight weeks (Cases 1191 to 1218).

In two of the twenty-eight cases treatment was commenced during an apyrexial period; in the remaining twenty-six cases the temperature fell to normal† within five days of the beginning of treatment.

In twenty-one cases parasites disappeared from the cutaneous blood in one to seven days. In the remaining seven (Nos. 1194, 1197, 1206, 1209, 1210, 1214 and 1218) parasites persisted practically throughout treatment (Table XIV).

RELAPSES

During treatment. In five of the twenty-eight cases, owing to the severity of the relapses and the grave clinical condition of the patients, it was found impossible to continue the treatment for the full period of eight weeks, e.g., in Cases 1214 and 1215 treatment had to be changed in the eighth week, in Case 1216 in the seventh week, and in Cases 1217 and 1218 in the fifth week. Consequently the number of cases under treatment was in the first week twenty-eight and in the eighth week twenty-three. The average weekly number, over a period of eight weeks, of cases which had (1) parasitic febrile relapses was 25·7 per cent of cases treated, (2) non-parasitic febrile attacks 6·3 per cent., (3) febrile paroxysms (parasitic and non-parasitic) 32·0 per cent., (4) parasitic relapses (febrile and non-febrile) 42·4 per cent. (Tables I and II).

After treatment. Eighteen of the twenty-three cases observed after cessation of treatment relapsed within the sixty days' observation period. Parasites re-appeared in one to thirty-seven days and

* Liq. arsenici HCl ℥ v
Quininae HCl gr. 1℥
Aq. chloroformi ad 5 i
3i. t.d.s.

† By this is meant that the temperature fell to normal and remained so for at least two days.

TABLE I.

C. Summary of results of oral administration of Liquor arsenici HCl minims 15 + Quinine HCl grains 5, daily for 8 weeks, in simple tertian malaria.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th
Number of cases treated...	28	28	28	28	26	26	25	23
Number of cases having parasitic febrile relapses ...	1	6	5	6	5	7	11	5
Number of cases having non-parasitic febrile attacks ...	1	0	4	5	2	4	1	4
Grand total of all febrile cases...	2	6	9	11	7	11	12	9
Total number of parasitic febrile relapses	1	11	8	14	9	18	23	12
Total number of non-parasitic febrile attacks ...	1	0	4	8	2	4	1	8
Grand total of all febrile paroxysms ...	2	11	12	22	11	22	24	20
Number of parasitic cases (febrile and non-febrile) ...	14	8	9	11	9	11	15	12
Total number of occasions parasites found ...	28	44	47	48	39	43	60	42

TABLE II.

Analysis of TABLE I.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th	Average per week
Percentage of parasitic febrile relapse cases per cases treated ...	3.6	21.4	17.8	21.4	19.2	26.8	44.0	21.7	25.7
Number of parasitic febrile relapses per parasitic febrile relapse case ...	2.0	1.0	1.8	1.8	1.4	1.6	1.1	1.8	1.5
Percentage of all febrile (parasitic and non-parasitic) cases per cases treated ...	7.1	21.4	32.1	39.2	26.8	42.3	48.0	39.1	32.0
Number of all febrile (parasitic and non-parasitic) paroxysms per febrile case ...	1.0	1.8	1.3	2.0	1.6	2.0	2.0	2.2	1.7
Percentage of all parasitic (febrile and non-febrile) cases per cases treated ...	50.0	28.6	32.1	39.3	34.6	42.3	60.0	52.2	42.4
Number of occasions parasites found per parasitic case ...	2.0	5.5	5.2	4.4	4.3	3.9	4.0	3.5	4.1

febrile relapses occurred in one to thirty-seven days after cessation of treatment. In five of the twenty-eight cases (Nos. 1214 to 1218) the full course of treatment was not completed as the condition was uncontrolled. These therefore should be added to the cases that relapsed, making the total number of failures twenty-three (82 per cent.).

In one of the five cases which did not relapse the post-treatment observation period was less than sixty days, viz., in Case 1195, thirty-seven days. Consequently the minimum number of relapses (those actually observed) was twenty-three and the possible maximum number (those actually observed + the number of cases not relapsing but lost sight of before expiration of the sixty-day post-treatment observation period) was twenty-four, giving a minimum percentage of 82 and a maximum percentage of 86 (Tables XIII and XIV).

D. Liquor arsenici HCl minims 15 and Liquor strychninae HCl minims 15 + Quinine HCl grains 5 daily* for eight weeks (Cases 1219 to 1243).

In four of the twenty-five cases treatment was commenced during an apyrexial period; in the remaining twenty-one cases the temperature fell to normal within eight days of the beginning of treatment.

In twenty-one cases parasites disappeared from the cutaneous blood in one to seven days. In seven cases (1221, 1222, 1238, 1239, 1241, 1242, and 1243) parasites persisted practically throughout treatment (Table XV).

RELAPSES

During treatment. In one (1243) of the twenty-five cases, owing to the severity of the relapses and the grave clinical condition of the patient, it was found necessary to alter the treatment in the sixth week. Consequently the number of cases under treatment was in the first week twenty-five and in the eighth week twenty-four. The average weekly number, over a period of eight weeks, of cases which had (1) parasitic febrile relapses was 13·2 per cent. of cases

* Liq. arsenici HCl ℥ 5
 Liq. strychninae HCl ℥ 5
 Quininae HCl gr. 1 $\frac{1}{2}$
 Aq. chloroformi ad 5 i
 5 i. t.d.s.

treated, (2) non-parasitic febrile attacks 7·1 per cent., (3) febrile paroxysms (parasitic and non-parasitic) 20·3 per cent., and (4) parasitic relapses (febrile and non-febrile) 37·6 per cent. (Tables III and IV).

After treatment. Of the twenty-three cases observed after cessation of treatment seventeen relapsed within the sixty-day observation period. Parasites re-appeared in one to twenty-six days and febrile relapses in seven to twenty-seven days after cessation of treatment. In one (1243) of the twenty-five cases the full course of treatment was not completed as the condition was uncontrolled. This case therefore should be added to the cases that relapsed, making the total number of failures eighteen (75 per cent.).

In two of the six cases which did not relapse the post-treatment observation period was less than sixty days, viz., in Case 1223, forty-two days and in Case 1227, thirty-eight days. Consequently the minimum number of relapses (those actually observed) was eighteen, and the possible maximum number (those actually observed + the number of cases not relapsing but lost sight of before expiration of the full post-treatment observation period of sixty days) was twenty, giving a minimum percentage of 75 and a maximum of 83 (Tables XIII and XV).

E. Control series. Quinine HCl grains 5 daily* for eight weeks (Cases 1244 to 1269).

In these twenty-six cases the temperature fell to normal within three days of the beginning of treatment.

In eighteen cases parasites disappeared from the cutaneous blood in from one to ten days. In ten cases (Nos. 1244, 1245, 1248, 1249, 1252, 1258, 1261, 1262, 1266 and 1268) parasites persisted practically throughout treatment (Table XVI).

RELAPSES

During treatment. In one (1268) of the twenty-six cases, as the condition was uncontrolled, the treatment was changed in the

* Quininae HCl gr. $1\frac{2}{3}$
Aq. chloroformi ad $\frac{5}{8}$ i
 $\frac{5}{8}$ i. t.d.s.

TABLE III.

D. Summary of results of oral administration of Liquor arsenici HCl minims 15 and Liquor strychninae HCl minims 15 + Quinine HCl grains 5, daily for 8 weeks, in simple tertian malaria.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th
Number of cases treated ...	25	25	25	25	25	24	24	24
Number of cases having parasitic febrile relapses ...	5	3	2	3	6	4	1	2
Number of cases having non-parasitic febrile attacks ...	1	3	2	1	1	2	1	3
Grand total of all febrile cases ...	6	6	4	4	7	6	2	5
Total number of parasitic febrile relapses	10	5	2	6	14	4	1	4
Total number of non-parasitic febrile attacks ...	1	4	2	1	2	3	4	9
Grand total of all febrile paroxysms ...	11	9	4	7	16	7	5	13
Number of parasitic cases (febrile and non-febrile) ...	11	10	9	9	8	8	10	9
Total number of occasions parasites found ...	21	35	31	33	34	26	35	43

TABLE IV.

Analysis of TABLE III.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th	Average per week
Percentage of parasitic febrile relapse cases per cases treated ...	20.0	12.0	8.0	12.0	24.0	16.7	4.2	8.3	13.2
Number of parasitic febrile relapses per parasitic febrile relapse case ...	2.0	1.7	1.0	2.0	2.3	1.0	1.0	2.0	1.6
Percentage of all febrile (parasitic and non-parasitic) cases per cases treated ...	24.0	24.0	16.0	16.0	28.0	25.0	8.3	20.8	20.3
Number of all febrile (parasitic and non-parasitic) paroxysms per febrile case ...	1.8	1.5	1.0	1.7	2.3	1.2	2.5	2.6	1.8
Percentage of all parasitic (febrile and non-febrile) cases per cases treated ...	44.0	40.0	36.0	36.0	32.0	33.3	41.7	37.5	37.6
Number of occasions parasites found per parasitic case ...	1.9	3.5	3.4	3.7	4.2	3.2	3.5	4.8	3.5

eighth week, and in another case (1269), which developed measles, treatment lasted for six weeks only. Consequently the number of cases under treatment was in the first week twenty-six and in the eighth week twenty-four.

The average weekly number, over a period of eight weeks, of cases which had (1) parasitic febrile relapses was 17.0 per cent. of cases treated, (2) non-parasitic febrile attacks 2.0 per cent., (3) febrile paroxysms (parasitic and non-parasitic) 19.0 per cent., and (4) parasitic relapses (febrile and non-febrile) 46.3 per cent. (Tables V and VI).

After treatment. Of the twenty-five cases observed after cessation of treatment fifteen relapsed within the sixty-day observation period. Parasites re-appeared in one to thirty-three days and febrile relapses occurred in one to nineteen days after cessation of treatment. In one (1268) of the twenty-six cases the full course of treatment was not completed as the condition was not controlled. This case therefore should be added to the cases that relapsed, making the total failures sixteen (62 per cent.).

In two of the ten cases which did not relapse the post-treatment observation period was less than sixty days, viz., in Case 1246, twenty-three days and in Case 1255, forty days. Consequently the minimum number of relapses (those actually observed) was sixteen, and the possible maximum number (those actually observed + the number of cases not relapsing but lost sight of before expiration of the post-treatment observation period of sixty days) was eighteen, giving a minimum percentage of 62 and a maximum of 69 (Tables XIII and XVI).

CONCLUSION

Daily administration of arsenic, or of arsenic and strychnine, in small doses (minims 15), in combination with quinine (grains 5) is not more effective than the same dose of quinine alone.

TABLE V.

E. Summary of results of oral administration of Quinine HCl grains 5 daily for 8 weeks, in simple tertian malaria.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th
Number of cases treated ...	26	26	26	26	26	26	25	24
Number of cases having parasitic febrile relapses ...	1	7	6	7	4	2	5	3
Number of cases having non-parasitic febrile attacks ...	0	0	1	0	1	0	0	2
Grand total of all febrile cases ...	1	7	7	7	5	2	5	5
Total number of parasitic febrile relapses	1	12	9	8	4	3	7	4
Total number of non-parasitic febrile attacks ...	0	0	1	0	1	0	0	4
Grand total of all febrile paroxysms ...	1	12	10	8	5	3	7	8
Number of parasitic cases (febrile and non-febrile) ...	11	13	12	11	13	12	13	10
Total number of occasions parasites found ...	27	55	59	47	52	56	53	37

TABLE VI.

Analysis of TABLE V.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th	Average per week
Percentage of parasitic febrile relapse cases per cases treated ...	3.8	26.9	23.1	26.9	15.4	7.7	20.0	12.5	17.0
Number of parasitic febrile relapses per parasitic febrile relapse case ...	1.0	1.7	1.5	1.1	1.0	1.5	1.4	1.3	1.3
Percentage of all febrile (parasitic and non-parasitic) cases per cases treated ...	3.8	26.9	26.9	26.9	10.2	7.7	20.0	20.8	19.0
Number of all febrile (parasitic and non-parasitic) paroxysms per febrile case ...	1.0	1.7	1.4	1.1	1.0	1.5	1.4	1.6	1.3
Percentage of all parasitic (febrile and non-febrile) cases per cases treated ...	42.3	50.0	46.2	42.3	50.0	46.2	52.0	41.7	46.3
Number of occasions parasites found per parasitic case ...	2.5	4.2	5.0	4.3	4.0	4.7	4.1	3.7	4.0

GROUP III. Large doses of arsenic

In view of the inefficiency of the small dose of arsenic (minims 15 daily) we proceeded to ascertain whether better results were obtainable by the use of double the dose (minims 30 daily).

F. Liquor arsenicalis minims 30 daily,* with one or two periods of intermission, for eight weeks (Cases 1270-1283).

It was intended to give the arsenic according to the following plan: four weeks on treatment, one week off treatment, three weeks on treatment; but in only seven of fourteen cases was it found possible to adhere to this plan. In five cases it was found necessary, owing to the development of symptoms of arsenical poisoning, to interrupt treatment on two occasions, and in the remaining two cases owing to loss of sight it was not possible to continue treatment beyond the sixth week (Table VII). In all cases toxic symptoms disappeared shortly after leaving off treatment.

TABLE VII.

Showing mode of administration of arsenic in the various cases in Series F.

Number of cases	Serial numbers	TREATMENT					Duration of treatment
		Weeks on	Weeks off	Weeks on	Weeks off	Weeks on	
7	1270 to 1272 and 1277 to 1280	4	1	3	...	...	8 weeks
5	1273 to 1276 and 1281	3	1	2	1	1	8 weeks
2	1282 and 1283	3	1	2	...	...	6 weeks

In one of the fourteen cases treatment was commenced during an apyrexial period; in the remaining thirteen cases the temperature fell to normal within ten days of the beginning of treatment.

In thirteen of the fourteen cases parasites disappeared from the cutaneous blood in from two to six days. In the remaining case (1278) parasites persisted practically throughout treatment (Table XVII).

* Liq. arsenicalis ℥ x
Aq. chloroformi ad ℥ i
℥ i. t.d.s.

RELAPSES

During treatment. In two (1282 and 1283) of the fourteen cases, owing to the development of severe symptoms of arsenical poisoning, it was found impossible to continue the treatment beyond the sixth week. Consequently the number of cases under treatment was in the first week fourteen and in the eighth week twelve. The average weekly number, over a period of eight weeks, of cases which had (1) parasitic febrile relapses was 3·8 per cent. of cases treated, (2) non-parasitic febrile attacks 3·5 per cent., (3) febrile paroxysms (parasitic and non-parasitic) 7·3 per cent., and (4) parasitic relapses (febrile and non-febrile) 28·1 per cent. (Tables VIII and IX).

After treatment. Eleven of the thirteen cases (85 per cent.), observed after cessation of treatment, relapsed within the sixty-day observation period. Parasites re-appeared in one to thirty-nine days and febrile relapses occurred in one to forty-two days after cessation of treatment (Tables XIII and XVII).

TABLE VIII.

F. Summary of results of oral administration of *Liquor arsenicalis minimis* 30 daily, with one or two intermissions, for 8 weeks, in simple tertian malaria.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th
Number of cases treated ...	14	14	14	14	14	14	12	12
Number of cases having parasitic febrile relapses ...	0	0	1	0	0	2	0	1
Number of cases having non-parasitic febrile attacks ...	1	1	1	1	0	0	0	0
Grand total of all febrile cases ...	1	1	2	1	0	2	0	1
Total number of parasitic febrile relapses	0	0	1	0	0	6	0	1
Total number of non-parasitic febrile attacks ...	2	3	1	4	0	0	0	0
Grand total of all febrile paroxysms ...	2	3	2	4	0	6	0	1
Number of parasitic cases (febrile and non-febrile) ...	9	3	2	1	2	4	4	5
Total number of occasions parasites found ...	15	8	3	7	9	14	14	21

TABLE IX.

Analysis of TABLE VIII.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th	Average per week
Percentage of parasitic febrile relapse cases per cases treated	0	0	7.1	0	0	14.3	0	8.3	3.8
Number of parasitic febrile relapses per parasitic febrile relapse case	0	0	1.0	0	0	3.0	0	1.0	0.6
Percentage of all febrile (parasitic and non- parasitic) cases per cases treated	7.1	7.1	14.3	7.1	0	14.3	0	8.3	7.3
Number of all febrile (parasitic and non- parasitic) paroxysms per febrile case	2.0	3.0	1.0	4.0	0	3.0	0	1.0	1.75
Percentage of all parasitic (febrile and non- febrile) cases per cases treated	64.3	21.4	14.3	7.1	14.3	28.6	33.3	41.7	28.1
Number of occasions parasites found per parasitic case	1.7	2.7	1.5	7.0	4.5	3.5	3.5	4.2	3.6

G. The same as Treatment F with an injection of Quinine 2 HCl grains 15 intramuscularly on each of the first two days only (Cases 1284-1316).

The object of this series of observations was to determine whether, having caused the disappearance of parasites from the cutaneous blood and having controlled symptoms by two initial intramuscular injections of quinine, the daily administration of *Liquor arsenicalis* minimis 30 would suffice to prevent relapses (parasitic and febrile). The arsenic was given according to the following plan: two weeks on treatment, one week off, two weeks on, one week off, two weeks on; all cases were able to tolerate this.

In five of the thirty-three cases treatment was commenced during an apyrexial period; in the remaining twenty-eight cases the temperature fell to normal within two days of the beginning of treatment.

In all cases parasites disappeared from the cutaneous blood in from one to four days (Table XVIII).

TABLE X.

G. Summary of results of administration of *Liquor arsenicalis* minims 30 daily, with two periods of intermission, for 8 weeks, + Quinine 2 HCl grains 15 intramuscularly on each of the first two days only, in simple tertian malaria.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th
Number of cases treated ...	33	33	32	32	32	32	32	31
Number of cases having parasitic febrile relapses ...	0	0	0	0	1	1	4	1
Number of cases having non-parasitic febrile attacks ...	0	3	3	2	1	3	0	3
Grand total of all febrile cases ...	0	3	3	2	2	4	4	4
Total number of parasitic febrile relapses	0	0	0	0	4	1	5	3
Total number of non-parasitic febrile attacks ...	0	3	7	3	3	5	0	3
Grand total of all febrile paroxysms ...	0	3	7	3	7	6	5	6
Number of parasitic cases (febrile and non-febrile) ...	0	0	0	1	2	1	4	2
Total number of occasions parasites found ...	0	0	0	2	8	6	13	13

TABLE XI.

Analysis of TABLE X.

Week of Treatment	1st	2nd	3rd	4th	5th	6th	7th	8th	Average per week
Percentage of parasitic febrile relapse cases per cases treated ...	0	0	0	0	3.1	3.1	12.5	3.2	2.7
Number of parasitic febrile relapses per parasitic febrile relapse case ...	0	0	0	0	4.0	1.0	1.0	3.0	1.1
Percentage of all febrile (parasitic and non-parasitic) cases per cases treated ...	0	9.4	9.7	6.2	6.2	12.5	12.5	12.0	8.7
Number of all febrile (parasitic and non-parasitic) paroxysms per febrile case ...	0	1.0	2.3	1.5	3.5	1.5	1.2	1.2	1.6
Percentage of all parasitic (febrile and non-febrile) cases per cases treated ...	0	0	0	3.1	6.2	3.1	12.5	6.4	3.9
Number of occasions parasites found per parasitic case ...	0	0	0	2.0	4.0	6.0	3.2	6.5	2.7

RELAPSES

During treatment. In one (1315) of the thirty-three cases, owing to the severity of the relapses and the grave clinical condition of the patient, it was found impossible to continue the treatment beyond the seventh week; in another case (1316) owing to intercurrent disease, treatment was given for two weeks only. Consequently the number of cases under treatment was in the first week thirty-three and in the eighth week thirty-one. The average weekly number, over a period of eight weeks, of cases which had (1) parasitic febrile relapses was 2.7 per cent. of cases treated, (2) non-parasitic febrile attacks 6.0 per cent., (3) febrile paroxysms (parasitic and non-parasitic) 8.7 per cent., and (4) parasitic relapses (febrile and non-febrile) 3.9 per cent. (Tables X and XI).

After treatment. Three of the thirty-one cases observed after cessation of treatment relapsed within the sixty-day observation period. Parasites re-appeared in one to fifteen days and febrile relapses occurred in one to nineteen days after cessation of treatment. In one (1315) of the thirty-three cases the full course of treatment was not completed as the condition was uncontrolled. This case therefore should be added to the cases that relapsed, making the total failures four (12.5 per cent.). (Tables XIII and XVIII.)

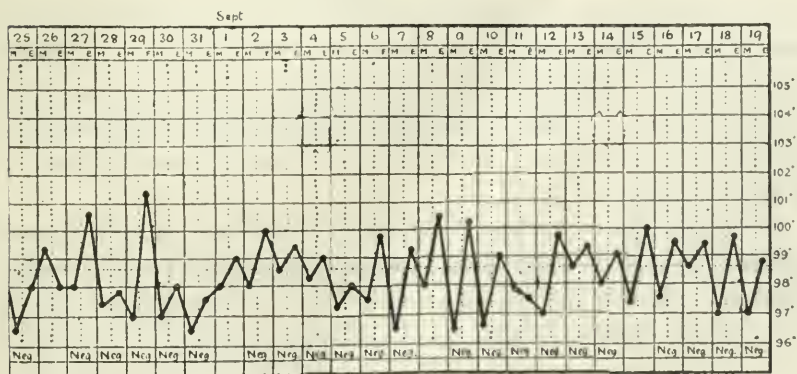
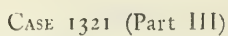
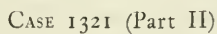
H. Control series. Quinine 2 HCl grains 15 intramuscularly on each of two consecutive days only (Cases 1317-1346).

In three of the thirty cases treatment was commenced during an apyrexial period; in the remaining twenty-seven cases the temperature fell to normal within three days of the beginning of treatment.

In all cases parasites disappeared from the cutaneous blood in from one to four days (Table XIX).

RELAPSES

After treatment. Twenty-one of the thirty cases (70 per cent.) observed for sixty days after cessation of treatment relapsed. Parasites re-appeared in six to twenty-five days and febrile relapses occurred in nine to twenty-five days after cessation of treatment (Tables XIII and XIX).



CONCLUSION

As a *palliative*, Liquor arsenicalis minims 30 daily appeared to exert a definite control of the temperature, the average weekly number of cases having parasitic febrile relapses being only 3·8 per cent. of cases treated; on the contrary, however, it failed in many cases to keep the cutaneous blood free from parasites, the average weekly number of cases having parasitic relapses (febrile and non-febrile) being 28·1 per cent. of cases treated. As a *curative*, the treatment was practically valueless, being followed by 85 per cent. of relapses.

The same treatment, however, with two initial injections of Quinine 2 HCl grains 15 gave very different results. The average weekly number of cases having parasitic febrile relapses was 2·7 per cent. of cases treated; but in contradistinction to the previous treatment the average weekly number of cases having parasitic relapses (febrile and non-febrile) was only 3·9 per cent. of cases treated. Furthermore, as a *curative* the result of this treatment (G) presented a striking contrast to that of the previous one (F), only 12·5 per cent. of cases relapsing within the post-treatment observation period of sixty days.

COMPARISON OF RESULTS OBTAINED FROM THE
VARIOUS TREATMENTS

PALLIATIVE

From the figures relating to series C, D and E it will be seen that there is no evidence that small doses of arsenic (minims 15 daily) in combination with quinine are more efficacious than the same dose of quinine alone. There is also no evidence that a combination of small doses of arsenic and strychnine with quinine is more efficacious than quinine alone.

From the figures relating to F and G it will be seen that Liquor arsenicalis alone in large doses (minims 30 daily for eight weeks) effectively controls the febrile relapses; but if reliance were placed solely upon febrile attacks as indicating infection a fallacious

TABLE XII.

Comparison of palliative results obtained from the different treatments.

	C	D	E	F	G
	Liquor arsenici HCl minims 15 + Quinine HCl grains 5 daily for 8 weeks	Liquor arsenici HCl minims 15 and Liquor strychninae HCl minims 15 + Quinine HCl grains 5 daily for 8 weeks	Quinine HCl grains 5 daily for 8 weeks	Liquor arsenicalis minims 30 daily with one or two intermissions, for 8 weeks	Liquor arsenicalis minims 30 daily with two periods of intermission for 8 weeks + Quinine 2 HCl grains 15 intramuscularly on each of the first two days only
Number of cases treated	28	25	26	14	33
Percentage of parasitic febrile relapse cases per cases treated (average per week)	25.7	13.2	17.0	3.8	2.7
Percentage of all febrile (parasitic and non-parasitic) cases per cases treated (average per week)	32.0	20.3	19.0	7.3	8.7
Percentage of all parasitic (febrile and non-febrile) cases per cases treated (average per week)	42.4	37.6	46.3	28.1	3.9

TABLE XIII.

Comparison of curative results obtained from the different treatments.

Series	Treatment	Number of cases observed after treatment *	Number of cases which relapsed within 60 days *	Number of cases not relapsing but observed for less than 60 days	Percentage of cases which relapsed	
					Minimum	Maximum
A	Liquor arsenicalis, minims 15 daily	3	3	...	100.0	100.0
B	Liquor arsenicalis minims 15 daily for 8 weeks + Quinine 2 HCl grains 15 intramuscularly, on each of the first two days only ...	2	2	...	100.0	100.0
C	Liquor arsenici HCl minims 15 + Quinine HCl grains 5 daily for 8 weeks	28	23	1	82.0	86.0
D	Liquor arsenici HCl minims 15 and Liquor strychninae HCl minims 15 + Quinine HCl grains 5 daily for 8 weeks	24	18	2	75.0	83.0
E	Quinine HCl grains 5 daily for 8 weeks	26	16	2	62.0	69.0
F	Liquor arsenicalis, minims 30 daily, with one or two periods of intermission, for 8 weeks	13	11	...	85.0	85.0
G	Liquor arsenicalis, minims 30 daily, with two periods of intermission, for 8 weeks + Quinine 2 HCl grains 15 intramuscularly on each of the first two days only	32	4	...	12.5	12.5
H	Quinine 2 HCl grains 15 intramuscularly on each of two consecutive days only	30	21	...	70.0	70.0

* Including those cases in which treatment was abandoned as the condition was uncontrolled.

estimate of its efficacy would be obtained, for Table XII shows that whereas the figure in series F for parasitic febrile relapse cases is 3·8 per cent., that of all parasitic relapse cases, both febrile and non-febrile, is 28·1 per cent. Arsenic in large doses, then, is anti-periodic in the sense that it controls the fever, but its control over parasites is much less. Further, the combination of quinine and arsenic in large doses is superior to arsenic alone, the total number of parasitic relapse cases being 3·9 per cent. for the combination and 28·1 per cent. for arsenic alone. Expressed in clinical terms, the combination of large doses of arsenic and quinine controls the patients' fever and renders their blood negative during the course of treatment to an extent that arsenic alone is incapable of effecting.

CURATIVE

It will be seen in Table XIII that there is little to choose between any of the treatments with the exception of G, which is a combination of large doses of arsenic with quinine. This treatment gave only 12·5 per cent. of relapses within the sixty-day post treatment observation period.

TABLE XIV.

C. Results of oral administration of *Liquor arsenici HCl* minims 15 + Quinine HCl grains 5 daily for 8 weeks, in simple tertian malaria.

† E.A. = East Africa.

M. = Mesopotamia.

S. = Salonika.

Number of case	Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse occurred in—days after cessation of treatment	Febrile relapse (above 100° F.) occurred in—days after cessation of treatment	Observation period (in days) in cases in which did not relapse	Remarks
								Week of Treatment											
								1st	2nd	3rd	4th	5th	6th	7th	8th				
1191	S.	12	4	4	6.9.18	Same day	1-2	P ₂	o	P ₃	1*	o	o	1 + P ₃	1 + P ₃	4	6	...	101° F. on 5th, 100° F. on 8th, 103° F. on 12th, 100° F. on 17th days; 101° F. on 18th, 103° F. on 19th, 104.5° F. on 21th days.
1192	S.	20	7	6	6.9.18	2	3	o	o	o	o	o	1*	o	o	34-37	37	...	
1193	S.	24	4	4	6.9.18	1	3	1*	o	o	2*	o	1*	1*	2*	13	19	...	
1194	S.	18	4	4	9.9.18	1	...	P ₃	2 + P ₅	2 + P ₂	3 + P ₂	o	o	1 + P ₂	5 + P ₂	1	7	...	
1195	S.	16	6	4	12.9.18	3	5	P ₁	o	o	o	o	o	o	o	...	...	37	
1196	S.	24	4	3	12.9.18	4	5	P ₁	o	o	o	o	o	o	o	15	16	...	
1197	S.	12	4	3	13.9.18	3	...	P ₂	2 + P ₂	P ₆	1*	o	1 + P ₁	3 + P ₃	P ₁	1	3	...	
1198	S.	23	4	4	13.9.18	2	4	o	o	1*	2*	1*	1 + P ₁	1 + P ₂	1	6	3	...	
1199	S.	15	4	4	17.9.18	3	7	P ₃	o	o	P ₁	P ₁	P ₃	P ₇	P ₁	1	2	...	
1200	E.A.	26	19	15	18.9.18	2	3	o	o	o	o	2 + P ₁	o	1	3 + P ₂	1	2	...	
1201	S.	26	15	15	19.9.18	Same day	1	o	o	o	2*	o	o	2	P ₂	5	...	...	Quinine orally grs. 30 on 11th day.
1202	S.	15	3	3	20.9.18	2	3	o	o	1*	o	o	o	o	o	...	...	64	

† Three days after commencement of treatment are allowed for the disappearance of parasites and for the fall of the temperature to normal; consequently, the records for the first week refer to the last three days only of that week.

TABLE XIV—continued.

Number of case	Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse occurred in — days after cessation of treatment	Febrile relapse (above 100° F.) occurred in — days after cessation of treatment	Observation period (in days) in cases in which relapse did not occur	Remarks	
								Week of Treatment												
								1st	2nd	3rd	4th	5th	6th	7th	8th					
1203	S.	26	4	4	23.9.18	2	4	○	○	○	○	○	P ₃	P ₅	P ₁	1	5	...	100° F. on 1st, 3rd and 5th days; 103.8° F. on 7th day.	
1204	S.	17	12	6	24.9.18	2	5	P ₁	○	○	○	○	1*	○	3*	11-12	11	...		
1205	S.	11	2	2	30.9.18	2	2	○	○	○	○	○	○	○	○	○	68	
1206	E.A.	28	4	2	4.10.18	2	...	1 + P ₂	2 + P ₅	2 + P ₅	2 + P ₅	1 + P ₆	P ₇	3 + P ₄	2 + P ₆	1	1	...		
1207	S.	25	5	4	9.10.18	2	5	P ₁	○	○	○	○	○	○	1*	66	100° F. on 5th and 8th days; 100.4° F. on 10th day, 100° F. on 22nd day.
1208	S.	2	4	3	15.10.18	3	4	○	○	○	○	1*	○	○	○	○	14	Quinine orally grs. 30 on 15th day
1209	S.	26	3	3	17.10.18	4	...	P ₃	2 + P ₄	P ₇	1 + P ₆	P ₇	4 + P ₃	1 + P ₃	P ₆	18	17	...	Pneumonia on cessation of treatment.	
1210	S.	13	7	6	17.10.18	2	...	P ₂	P ₃	1 + P ₅	P ₂	P ₂	3	P ₁	P ₄	11	13	...		
1211	S.	27	5	5	18.10.18	Apyrexia	2	○	1 + P ₅	P ₁	P ₆	1	1	1 + P ₂	P ₄	9	...	...	Quinine orally grs. 30 on 11th day
1212	S.	28	6	4	18.10.18	1	2	○	○	○	○	○	○	○	○	○	96	Bronchial pneumonia on cessation of treatment.
1213	M.	40	4	3	21.10.18	Same day	2	○	○	1*	P ₁	P ₅	1*	P ₂	2*	11	...	...	Quinine orally grs. 30 on 13th day
1214	...	...	...	...	13.10.18	5	...	P ₂	2 + P ₆	1 + P ₅	P ₁	3	7	7	...	...	...	...	Treatment changed: condition uncontrolled.
1215	S.	25	4	3	11.9.18	2	4	○	○	○	○	○	P ₂	2 + P ₃	...	...	...	...	Quinine intramuscularly in 8th week.
1216	S.	11	6	5	30.8.18	2	6	P ₂	○	1*	4 + P ₂	2 + P ₃	1 + P ₅	...	...	...	...	...	Quinine intramuscularly in 7th week.
1217	S.	3	4	3	10.9.18	Apyrexia	2	○	○	○	2 + P ₆	...	...	...	...	...	...	...	Quinine intramuscularly in 5th week.
1218	S.	15	5	4	10.9.18	4	...	P ₂	P ₄	2 + P ₅	2 + P ₅	...	...	...	...	...	...	...	Quinine intramuscularly in 5th week.

TABLE XV.

D. Results of oral administration of Liquor arsenici HCl minims 15 and Liquor strychninae HCl minims 15 + Quinine HCl grains 5 daily for 8 weeks, in simple tertian malaria.

† E. = Egypt. E.A. = East Africa. S. = Salonika.

Number of case	Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse occurred in—days after cessation of treatment	Febrile relapse (above 100° F.) occurred in—days in cases which did not relapse	Remarks	
								Week of Treatment											
								1st	2nd	3rd	4th	5th	6th	7th	8th				
1219	S.	24	5	4	7.9.18	Apyrexia	1	0	0	0	0	0	0	0	0	9	12	...	Not observed after treatment. Quinine intramuscularly on 1st day.
1220	S.	15	4	4	7.9.18	2	2	0	0	0	0	0	0	0	0	...	...	...
1221	E.A.	10	4	3	8.9.18	4	7	† P ₃	P ₁	P ₁	P ₂	2 + P ₂	1 + P ₂	1 + P ₆	P ₇	1	...	...
1222	E.A.	13	8	6	8.9.18	8	...	3	1 + P ₆	P ₂	P ₂	P ₂	0	2*	0	0	10	10	...
1223	S.	20	4	4	8.9.18	1	4	0	P ₁	P ₂	0	0	0	0	0	0	...	...	42
1224	S.	14	4	3	9.9.18	4	4	1*	P ₁	0	0	0	0	P ₁	0	7	8	...	Quinine orally grs. 45 on 21st day.
1225	S.	16	4	3	11.9.18	2	4	P ₁	0	0	P ₂	P ₂	0	P ₁	P ₅	1	...	...
1226	S.	12	7	6	12.9.18	6	6	2	1*	0	1 + P ₂	3	1 + P ₂	P ₃	1 + P ₆	1	14	...	
1227	S.	14	8	8	12.9.18	Same day	5	P ₁	0	0	0	0	0	0	0	...	...	38	
1228	S.	13	4	3	17.9.18	2	2	0	0	0	0	0	0	0	1*	...	...	69	100-8° F. on 35th day.
1229	S.	14	4	3	17.9.18	3	5	P ₁	P ₂	0	0	0	0	0	0	P ₁	3	10	...

* Three days after commencement of treatment are allowed for the disappearance of parasites and for the fall of the temperature to normal; consequently, the records for the first week refer to the last three days only of that week.

TABLE XV—continued.

Number of case	Place of infection	Interval (in months) between admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse occurred in — days after cessation of treatment	Febrile relapse (above 100° F.) occurred in — days after cessation of treatment	Observation period (in days) in cases which did not relapse	Remarks
								Week of Treatment											
								1st	2nd	3rd	4th	5th	6th	7th	8th				
1230	S.	15	4	4	20.9.18	5	4	0	2*	1	0	2 + P ₂	1 + P ₅	0	3*	11	14	...	100° F. on 3rd, 5th and 7th days.
231	S.	12	8	8	20.9.18	7	7	3	1*	0	0	0	1*	0	0	8	8	...	
1232	S.	24	8	7	22.9.18	2	2	0	0	0	0	0	0	0	0	...	...	66	
1233	S.	13	3	2	24.9.18	3	4	0	0	0	0	0	P ₅	P ₄	P ₆	1	...	...	Colloidal manganese on 3rd day.
1234	S.	15	7	5	27.9.18	2	2	0	0	1*	0	0	P ₁	0	0	8	7	...	
1235	S.	15	5	5	4.10.18	1	3	0	0	0	0	0	0	0	0	26	27	...	
1236	S.	11	5	4	9.10.18	1	1	0	0	0	0	0	0	0	0	19	...	...	Quinine orally grs. 45 on 20th day.
1237	E.	2	5	3	18.10.18	2	4	0	0	0	0	0	0	4*	5*	...	...	63	Influenza in 7th, pneumonia in 8th weeks.†
1238	S.	16	9	9	18.10.18	1	2	0	3 + P ₃	P ₃	2 + P ₅	1 + P ₄	1	P ₅	P ₆	1	...	...	Quinine orally grs. 30 on 7th day.
1239	S.	28	7	6	23.10.18	1	7	P ₃	P ₂	P ₇	P ₂	0	0	P ₄	3	...	...	77	Bronchial pneumonia on cessation of treatment.
1240	S.	10	2	2	24.10.18	Apyrexia	2	0	0	1*	1*	2*	P ₃	P ₁	0	5	5	...	Quinine orally grs. 15 on 10th day
1241	S.	...	...	...	24.10.18	Apyrexia	...	1	P ₇	P ₆	3	2	0	P ₇	P ₇	1	...	...	Quinine orally grs. 30 on 7th day
1242	S.	23	5	4	28.10.18	Apyrexia	...	P ₁	1 + P ₄	P ₂	P ₆	P ₇	P ₁	P ₂	P ₁	7	...	...	Quinine intramuscularly in 6th week.
1243	E.A.	13	7	1	11.9.18	2	...	1 + P ₁	P ₃	1 + P ₆	P ₇	4 + P ₃	...	...	...	...	...	...

† During treatment.

TABLE XVI.

E. Results of oral administration of Quinine HCl grains 5 daily for 8 weeks, in simple tertian malaria.

† E. = Egypt. E.A. = East Africa. S. = Salonika.

Number of case	†Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse occurred in—days after cessation of treatment	Febrile relapse (above 100° F.) occurred in—days after cessation of treatment	Observation period (in days in cases in which did not relapse)	Remarks
								Week of Treatment											
								1st	2nd	3rd	4th	5th	6th	7th	8th				
1244	S.	23	6	6	4-9-18	2	...	+ P ₂₃	4 + P ₂₁	2 + P ₂₅	1 + P ₄	1 + P ₄	P ₇	1 + P ₅	P ₅	1	8	...	101.2° F. on 2nd day (bronchitis); 100° F. on 40th day. 100° F. on 26th and 35th days. Colloidal manganese on 2nd day. Quinine orally on 23rd day. Colloidal manganese on 2nd day.
1245	E.A.	9	5	3	7-9-18	1	...	P ₂₁	1 + P ₆	P ₆	2 + P ₁	P ₇	P ₄	0	1 + P ₂	1	19	...	
1246	S.	12	4	4	9-9-18	2	3	0	0	1*	0	0	0	0	0	...	...	23
1247	S.	24	4	3	12-9-18	1	3	0	0	0	0	0	0	0	3*	...	...	8½
1248	S.	15	4	4	15-9-18	2	3	0	1	1 + P ₄	1 + P ₄	1 + P ₃	P ₁	2 + P ₂	P ₂	13	...	...
1249	S.	13	6	6	25-9-18	2	...	P ₂₁	1 + P ₃	2 + P ₅	P ₅	P ₆	P ₇	P ₅	P ₇	1	...	...
1250	S.	11	5	4	25-9-18	1	10	P ₃₁	P ₃₁	0	0	P ₁	P ₁	0	0	15	...	...
1251	S.	3	4	3	25-9-18	1	2	0	0	0	0	0	0	0	0	...	...	86
1252	E.	37	4	3	25-9-18	Same day	...	1 + P ₂₁	P ₂₁	P ₅	1 + P ₄	P ₄	P ₃	2 + P ₅	P ₂	1	...	...
1253	S.	4	3	2	25-9-18	1	2	0	P ₂	P ₂	0	P ₄	P ₄	P ₅	1	2	1	...	
1254	S.	13	4	3	26-9-18	1	3	0	0	0	0	1*	0	0	0	...	...	70

* Three days after commencement of treatment are allowed for the disappearance of parasites and for the fall of the temperature to normal; consequently, the records for the first week refer to the last three days only of that week.

TABLE XVI—continued.

Number of case	Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse after cessation of treatment	Febrile relapse (above 100° F.) occurred in—days after cessation of treatment	Observation period (in days) in cases in which did not relapse	Remarks
								Week of Treatment											
								1st	2nd	3rd	4th	5th	6th	7th	8th				
1255	S.	24	3	2	26.9.18	1	2	0	0	0	0	0	0	0	...	...	40	Quinine orally grs. 30 on 35th day.
1256	S.	14	6	4	26.9.18	1	2	0	P ₁	0	0	0	P ₁	P ₁	33	...	...	...
1257	S.	23	6	5	27.9.18	2	5	P ₁	0	0	0	0	0	0	...	...	65	
1258	S.	21	8	7	27.9.18	3	...	P ₁	2 + P ₁	P ₁	P ₁	P ₁	P ₁	0	15	...	...	Quinine orally grs. 45 on 15th day.
1259	S.	13	4	3	29.9.18	2	2, 3	0	0	1	1 + P ₃	0	1 + P ₃	1 + P ₁	15	...	...
1260	S.	28	8	7	1.10.18	Same day	2	0	0	0	0	0	0	0	...	...	79	
1261	S.	27	5	5	13.10.18	2	2	0	1 + P ₁	P ₁	P ₃	1	P ₂	P ₃	4	5	...		
1262	E.A.	16	10	7	14.10.18	3	...	P ₁	1 + P ₁	1 + P ₂	1 + P ₂	P ₂	1 + P ₁	P ₇	1	9	...		
1263	S.	24	4	4	14.10.18	2	3	0	0	0	0	0	0	0	...	...	99	
1264	S.	28	5	5	18.10.18	Same day	1	0	0	0	0	0	0	0	...	...	61	
1265	S.	6	5	4	21.10.18	1	5	P ₁	0	0	0	0	P ₁	0	1	...	...	No febrile relapse in 77 days.
1266	S.	28	5	5	21.10.18	2	...	P ₃	2 + P ₁	2	1	1 + P ₃	0	P ₁	2	...	...	Quinine orally grs. 30 on 12th day
1267	S.	15	5	5	22.10.18	1	3	0	0	0	0	P ₃	2 + P ₃	P ₆	1	...	...	Quinine orally grs. 30 on 7th day.
1268	S.	27	4	3	22.0.18	Same day	...	P ₃	P ₇	P ₆	P ₁	P ₁	P ₆	P ₆	...	...	...	Treatment changed.
1269	S.	14	4	4	17.9.18	Same day	1	0	0	0	0	0	0	...	...	...	84	Measles in 1st week.

F. Results of oral administration of *Liquor arsenicalis* minimis 30 daily, with one or two intermissions, for 8 weeks, in simple tertian malaria.

† E.A. = East Africa. S. = Solonika.

Number of case	Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse after in—days cessation of treatment	Febrile relapse (above 100° F.) occurred in—days after cessation of treatment	Observation period (in days) in cases which did not relapse	Remarks
								Week of Treatment											
								1st	2nd	3rd	4th	5th	6th	7th	8th				
1270	S.	12	3	3	21.8.18	Same day	3	○	○	○	○	○	○	○	P ₁	11	29	...	(post-treatment) 100.4° F. on 6th, 100° F. on 7th days. Influenza first 2 weeks. §
1271	E.A.	9	6	2	24.8.18	10	5	+2* P ₁	3*	○	○	○	○	○	○	11	16	...	
1272	S.	15	3	3	24.8.18	2	5	○	○	○	○	○	○	○	○	...	...	103	100.4° F. on 4th, 100° F. on 58th, 61st and 66th days.
1273	S.	26	3	2	26.8.18	Same day	2	○	○	○	○	○	○	○	○	...	...	66	
1274	S.	15	3	3	26.8.18	2	5	P ₁	○	○	○	○	○	○	○	...	...	...	Not observed.
1275	S.	10	3	3	27.8.18	4	6	P ₂	○	○	○	○	○	○	1 + P ₃	1	1	...	
1276	S.	13	3	2	28.8.18	1	6	P ₂	P ₁ 1 + P ₁	○	○	○	○	○	○	3	11	...	
1277	S.	11	7	7	28.8.18	5	3	○	○	○	○	○	P ₁	P ₂	○	15	42	...	
1278	S.	12	5	5	29.8.18	4	...	P ₃	P ₁	P ₁	P ₇	P ₅ 5 + P ₁	P ₅	P ₆	5	8	...	No febrile relapse in 44 days.	
1279	S.	12	3	3	4.9.18	1	4	○	○	○	○	○	○	○	P ₁	13	...	...
1280	S.	24	4	3	16.9.18	3	5	P ₁	○	○	○	P ₁ 1	P ₅	P ₅	P ₇	1	10	...	
1281	E.A.	21	8	6	28.9.18	Apixia	3	P ₁	○	○	○	○	○	○	○	39	39	...	Symptoms of arsenical poisoning. Discharged on 8th day.
1282	S.	23	1	1	30.7.18	2	4	P ₂	P ₁	○	○	○	P ₁	...	...	8	...	...	Treatment stopped owing to total but temporary blindness. No febrile relapse in 62 days but parasites present daily.
1283	S.	14	2	2	10.8.18	3	6	P ₂	1*	4*	...	...	...	...	...	8	...	...

* Three days after commencement of treatment are allowed for the disappearance of parasites and for the fall of the temperature to normal; consequently, the records for the first week refer to the last three days only of that week. § During treatment.

TABLE XVIII.

G. Results of administration of *Liquor arsenicallis* minimi 30 daily, with two periods of intermission, for 8 weeks + Quinine 2 HCl grains 15 intramuscularly on each of the first two days only, in simple tertian malaria.

† E. = Egypt.

E.A. = East Africa.

S. = Salonika.

Number of case	† Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse in—days after cessation of treatment	Febrile relapse (above 100° F.) occurred in—days in cases in which relapse did not occur	Remarks
								Week of Treatment										
								1st	2nd	3rd	4th	5th	6th	7th	8th			
1284	S.	23	3	3	4.9.18	1	2	0	0	0	0	0	0	0	...	...	65	Symptoms of arsenical poisoning.†
1285	S.	24	4	4	5.9.18	1	1	0	0	0	0	0	0	0	...	...	71	
1286	S.	14	4	4	5.9.18	1	2	0	0	0	0	0	0	0	...	...	69	100° F. on 33rd day
1287	S.	25	4	3	5.9.18	Apyrexia	1	0	0	P ₁	0	0	0	0	...	...	137	
1288	S.	14	5	4	8.9.18	1	2	0	0	0	0	0	0	0	...	...	67	100° F. on 55th day.
1289	S.	16	8	7	12.9.18	1	1	0	1*	0	P ₂	4 + P ₂	1 + P ₃	1 + P ₅	P ₆	19	...	
1290	S.	25	4	4	14.9.18	Apyrexia	1	0	0	0	0	0	0	0	...	...	72	
1291	E.A.	9	7	5	17.9.18	Same day	2	0	0	0	0	0	0	0	...	...	69	102° F. on 13th day.
1292	S.	18	12	3	19.9.18	Same day	2	0	0	0	0	0	0	0	...	...	...	Not observed: died of pneumonia.
1293	S.	10	4	3	20.9.18	1	4	0	0	0	0	0	0	1	3 + P ₄	1	...	
1294	S.	24	4	3	20.9.18	1	1	0	0	0	2*	0	0	0	...	...	74	Temperature in 4th† week due to catarrhal cold.
1295	S.	27	3	3	23.9.18	1	3	0	0	0	0	0	0	0	...	...	70	103° F. on 10th day.
1296	S.	22	4	3	24.9.18	1	2	0	0	0	0	0	0	0	...	...	70	100° F. on 15th and 17th days.
1297	S.	16	4	3	24.9.18	Apyrexia	2	0	0	0	0	0	0	0	...	...	63	
1298	S.	16	4	4	26.9.18	1	2	0	0	0	0	0	0	1*	...	...	64	100° F. on 23rd day.

* During treatment.

TABLE XVIII—continued

Number of case	Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Number of febrile paroxysms (parasitic and non-parasitic) and results of blood examinations during treatment								Parasitic relapse occurred in—days after cessation of treatment	Febrile relapse (above 100° F.) occurred in—days after cessation of treatment	Observation period (in days) in cases in which relapse did not occur	Remarks
								Week of Treatment											
								1st	2nd	3rd	4th	5th	6th	7th	8th				
1299	S.	21	4	4	31.9.18	1	2	0	0	0	0	0	0	0	1*	100	101.6° F. on 12th day (bronchial catarrh).
1300	E.A.	13	9	4	2.10.18	1	2	0	0	1*	0	0	0	0	0	...	...	117
1301	E.	16	5	5	10.10.18	Same day	1	0	0	0	0	0	0	0	0	...	...	67
1302	S.	18	10	4	13.10.18	1	2	0	0	0	0	0	0	0	0	...	...	69
1303	E.A.	27	8	6	16.10.18	1	1	0	0	1*	0	0	0	0	0	...	...	76
1304	S.	24	6	4	16.10.18	1	2	0	0	0	0	3*	0	0	0	...	...	104
1305	S.	15	2	2	21.10.18	1	3	0	0	0	0	0	0	0	0	...	...	125
1306	S.	15	5	5	22.10.18	1	2	0	0	0	1*	0	2*	0	0	...	...	98
1307	S.	2	4	4	22.10.18	1	3	0	0	5*	0	0	0	0	0	...	...	60
1308	S.	28	10	9	23.10.18	Apyrexia	1	0	0	0	0	0	0	0	0	...	...	96
1309	S.	15	3	2	23.10.18	Apyrexia	1	0	0	0	0	0	1*	0	0	...	...	112
1310	S.	16	3	2	24.10.18	2	2	0	0	0	0	0	0	0	0	...	...	66
1311	S.	16	5	5	24.10.18	1	2	0	0	0	0	0	0	0	0	...	...	60
1312	S.	16	4	3	25.10.18	1	3	0	0	0	0	0	0	0	0	...	...	94
1313	E.A.	8	4	2	26.10.18	2	3	0	0	0	0	0	2*	2	1*	15	16	...	Influenza in 6th and 7th weeks.†
1314	S.	30	3	2	24.8.18	Same day	2	0	1*	0	0	0	0	0	0	93	Symptoms of arsenical poisoning.†
1315	E.A.	10	7	3	27.6.18	1	3	0	1*	0	0	0	0	1 + P ^a	Treatment changed.
1316	E.A.	7	7	1	8.6.18	1	2	0	0	60	104° F. on 9th day.

† During treatment.

TABLE XIX.

H. Results of administration of Quinine 2 HCl grains 15 intramuscularly on each of two consecutive days only, in simple tertian malaria

* E.A. = East Africa. F. = France. It. = Italy. S. = Salonika.

Number of case	*Place of infection	Interval (in months) between first admission to a hospital with malaria and present treatment	Interval (in months) between leaving infected area and present treatment	Interval (in months) between arrival in England and present treatment	Date of end of treatment	Temperature fell to normal in — days after first dose	Parasites disappeared from cutaneous blood in — days after first dose	Parasitic relapse occurred in — days after last dose	Febrile relapse (above 100°F.) occurred in — days after last dose	Observation period (in days) in cases which did not relapse	Remarks
1317	S.	11	2	1	25.6.18	Apyrexia	2	18	18	...	
1318	S.	13	5	4	25.6.18	1	3	15	21	...	
1319	S.	9	3	2	25.6.18	1	4	22	22	...	
1320	S.	12	3	2	5.7.18	1	2	15	18	...	100°F. on 8th day
1321	S.	23	2	2	6.7.18	Same day	1	...	...	87	Irregular temperature after treatment <i>vide</i> chart.
1322	S.	22	2	1	6.7.18	Same day	1	12	15	...	
1323	S.	1	2	1	6.7.18	3	1	23	24	...	
1324	S.	9	2	2	7.7.18	Same day	1	11	13	...	
1325	S.	9	3	2	9.7.18	Same day	2	19	22	...	
1326	S.	27	10	1	11.7.18	1	1	14	22	...	
1327	S.	23	10	1	12.7.18	1	1	18	22	...	
1328	S.	16	10	1	12.7.18	1	2	12	13	...	
1329	S.	25	2	2	14.7.18	...	2	25	...	...
1330	It.	13	0	0	22.7.18	1	2	10	14	...	
1331	S.	26	9	2	23.7.18	1	2	17	19	...	
1332	S.	11	2	1	25.7.18	Apyrexia	2	...	...	92	
1333	S.	10	2	1	27.7.18	Apyrexia	2	...	...	66	
1334	S.	11	7	6	27.7.18	1	2	...	...	73	101°F. on 24th day
1335	S.	12	4	3	28.7.18	Same day	2	...	...	73	
1336	S.	23	4	2	28.7.18	Same day	1	...	...	68	100°F. on 34th day
1337	E.A.	16	7	4	28.7.18	2	3	13	15	...	
1338	S.	21	6	5	28.7.18	2	2	20	21	...	
1339	S.	9	5	4	28.7.18	1	1	...	...	65	
1340	S.	15	6	5	28.7.18	1	2	16	15	...	
1341	E.A.	8	5	1	31.7.18	Same day	3	6	9	...	
1342	F.	2	2	2	8.8.18	Same day	3	23	25	...	
1343	S.	...	...	...	14.8.18	1	3	...	...	71	
1344	S.	24	3	3	22.8.18	1	1	21	24	...	
1345	S.	12	2	1	23.8.18	1	2	20	22	...	
1346	S.	...	...	...	23.8.18	1	1	...	...	62	100°F. on 18th, 24th and 25th days.